**Types of distributions**

**1. Normal Distribution**

* **Description**: Also known as the Gaussian distribution, it is symmetrical, bell-shaped, and characterized by its mean (μ) and standard deviation (σ).
* **Example**: Heights of people, test scores.

**2. Uniform Distribution**

* **Description**: All outcomes are equally likely within a certain range. Can be continuous or discrete.
* **Example**: Rolling a fair die (discrete), random number generation between 0 and 1 (continuous).

**3. Binomial Distribution**

* **Description**: Describes the number of successes in a fixed number of independent Bernoulli trials (each with the same probability of success).
* **Example**: Number of heads in 10 coin flips.

**4. Poisson Distribution**

* **Description**: Describes the number of events occurring within a fixed interval of time or space, given the events occur with a known constant mean rate and independently of the time since the last event.
* **Example**: Number of emails received in an hour.

**5. Exponential Distribution**

* **Description**: Describes the time between events in a Poisson process, with a constant average rate.
* **Example**: Time until the next earthquake, time between arrivals of customers at a service point.

**6. Geometric Distribution**

* **Description**: Describes the number of trials needed to get the first success in a sequence of independent Bernoulli trials.
* **Example**: Number of coin flips until the first heads.

**7. Negative Binomial Distribution**

* **Description**: Generalizes the geometric distribution to describe the number of trials needed to achieve a specified number of successes.
* **Example**: Number of basketball shots needed to score 10 baskets.

**8. Chi-Square Distribution**

* **Description**: Arises in the context of estimating variances and is used in hypothesis testing, particularly in chi-square tests for independence and goodness-of-fit.
* **Example**: Distribution of sum of squared standard normal variables.

**9. Student's t-Distribution**

* **Description**: Similar to the normal distribution but with heavier tails, used when estimating population parameters when the sample size is small and/or the population variance is unknown.
* **Example**: Test statistics in t-tests.

**10. Log-Normal Distribution**

* **Description**: A distribution of a variable whose logarithm is normally distributed.
* **Example**: Distribution of incomes, stock prices.

**11. Beta Distribution**

* **Description**: Defined on the interval [0, 1], used in Bayesian statistics and to model proportions and probabilities.
* **Example**: Prior distributions in Bayesian analysis.

**12. Gamma Distribution**

* **Description**: Generalizes the exponential distribution and is used in queuing models, reliability analysis, and to model waiting times.
* **Example**: Time until the next k events in a Poisson process.

**13. Weibull Distribution**

* **Description**: Used in reliability analysis and life data analysis, it can model increasing, constant, or decreasing failure rates.
* **Example**: Lifespan of products, time to failure of mechanical components.

**14. Cauchy Distribution**

* **Description**: Has heavy tails and undefined mean and variance, used in certain robust statistics.
* **Example**: Resonance behavior, certain problems in physics.

**15. Bernoulli Distribution**

* **Description**: The simplest discrete distribution, representing a single trial that results in either success or failure.
* **Example**: Flipping a coin (success = heads, failure = tails).

**How convert to normal distribution**

**Standardization (Z-Score Transformation)**

Standardization involves converting data to have a mean of 0 and a standard deviation of 1. This does not make the data normal, but it normalizes the scale of the data.

* **Formula**: Z=X−μσZ = \frac{X - \mu}{\sigma}Z=σX−μ​
* **Steps**:
  1. Calculate the mean (μ) and standard deviation (σ) of the data.
  2. Subtract the mean from each data point and divide by the standard deviation.